

City of Greenwood

Stormwater Program Study

A supplemental engineering summary for the determination of the Stormwater Utility Rate.



Prepared for the
City of Greenwood Common Council and
City of Greenwood Stormwater Board
November 2012



Table of Contents

1	Executive Summary	2
2	Purpose.....	2
3	Background	2
4	Greenwood MS4 Program	3
5	Stormwater Master Plan Summary	4
5.1	Project Summaries	6
6	Stormwater Program Organization	11
7	Rate Study Findings.....	12
7.1	Operation and Maintenance Costs	12
7.2	Capital	12
7.3	Equivalent Residential Unit (ERU).....	12
7.4	Revenue Requirement	13
8	Conclusions.....	15

Appendix

Appendix A.....	Proposed Capital Project Location Map
Appendix B.....	Proposed Capital Project Fact Sheets
Appendix C	Completed Initial Priority Rating Forms

1 Executive Summary

The City of Greenwood is a federal and state regulated stormwater community through the Indiana Department of Environmental Management (IDEM) 327 IAC 15-13 (Rule 13). The City carries out required annual stormwater program activities per its approved National Pollution Discharge Elimination System (NPDES) permit (INR040032). The City also carries out operation and maintenance (O&M) activities on the storm sewer system and associated assets, which have in the past been funded by non-dedicated sources. The City established an interim stormwater service charge to provide a temporary dedicated funding source to meet the program's minimum needs. The City has completed its study to determine a final stormwater service charge rate for annual regulatory, O&M costs, and to provide revenue for proposed stormwater capital projects. These capital projects will address current and ongoing stormwater issues within the community, and will help the City maintain compliance with their NPDES permit. The City is currently proposing an average yearly expenditure of approximately \$1.2 million for O&M. In addition to the O&M costs, the City proposes to complete approximately \$19.0 million in stormwater project planning, design and construction over the next 10 years. The \$19.0 million includes the City's fifteen (15) proposed stormwater improvement capital projects and miscellaneous stormwater program costs & projects.

A proposed stormwater user fee will be assessed to land owners within the corporate limits and is based upon the amount of impervious surface area, which generates stormwater runoff from the property. To ensure that residential and non-residential properties are charged a fair and impartial monthly fee, the City determined an Equivalent Residential Unit (ERU), which defines the average amount of impervious surface on an average residential parcel as 2,800 square feet (sq.ft.). The City utilized ArcGIS, the City's existing parcel data, and aerial photography to identify approximately 42,300 ERUs within the City's corporate limits.

2 Purpose

The purpose of this summary report is to illustrate the costs associated with the development of the City of Greenwood's Stormwater Department, which include; proposed capital project costs, and costs associated with ongoing system O&M.

This summary report will also describe the determination of the Equivalent Residential Units (ERU) and an estimate of the numbers of ERUs systemwide. The ERUs estimate combined with the program costs information was utilized to assist the City's financial analysis/rate study for service charge determination.

3 Background

The City of Greenwood is a State of Indiana designated owner and operator of a Municipal Separate Storm Sewer System (MS4). The City is required to implement and maintain the NPDES stormwater permit per 327 IAC 15-13 (Rule 13). The City operates an extensive network of separate storm sewer system that includes pipes, ditches, manholes, inlets and outlets on an annual basis.

Because of the declining general funding revenue, and the growing obligations for these funds elsewhere, the City determined it was necessary to investigate the establishment of dedicated stormwater funding in order to meet the continued and growing revenue needs of the stormwater system.

4 Greenwood MS4 Program

The City of Greenwood entered into its first NPDES Stormwater permit in 2005. This permit established requirements for formulating and implementing a Stormwater Quality Management Program. This program is responsible for the public outreach and education, where responsibilities are jointly distributed amongst the Johnson County Partnership for Water Quality. This partnership includes the following entities: City of Franklin, City of Greenwood, Town of Bargersville, Town of Whiteland, Town of New Whiteland, Town of Edinburgh, Johnson County, Johnson County Soil & Water Conservation District (JCSWCD), and Johnson County Solid Waste Management District (JCSWMD). This partnership has educated local schools and community groups through the joint effort of JCSWCD and JCSWMD, and they have also provided further education to contractors, developers, utility companies, etc. through workshops. These educational efforts have been directed toward informing the public, their involvement in keeping waterways clean, and how to be better stewards of natural resources.

The City has made efforts to improve the water quality within their MS4 boundary, which they have done by implementing specifications & standards required by their NPDES permit. All developments disturbing land within the City limits are required to develop and follow a stormwater pollution prevent plan (SWPPP), which are reviewed by the City's Engineering staff. These plans will help to limit the amount of sediment leaving sites during construction, and will establish practices after construction to protect water quality. This is completed through the establishment of stormwater best management practices (BMPs), which control either stormwater quality or quantity. The City has made great efforts to enforce these requirements, and has imposed strict fines on sites that violate their discharge requirements. These fines range from a minimum of two hundred dollars (\$200) to five thousand dollars (\$5,000) per violation, depending on the severity and type of violation.

The City has also been proactive about their water quality problems, and has spent between over \$100,000 in 2009 and 2010 on stormwater drainage projects, which focused on eliminating erosion and flooding problems throughout the City. They are furthering this effort through the development and implementation of a Stormwater Master Plan, which is briefly discussed in **Section 5**. They have also developed a Stormwater Quality Management Plan, which can be found in the City's website (<http://www.greenwood.in.gov/>).

5 Stormwater Master Plan Summary

The master plan provides documentation, review, analysis, and recommendations for the City of Greenwood's Stormwater Utility. This master plan was developed as a guide to assist the City in creating a comprehensive plan to fund water quality control, operation and maintenance activities, and capital project and flood control projects that affect the City's current stormwater infrastructure.

The City of Greenwood is located within Johnson County and is approximately bounded by East County Line Road to the north; Interstate 65 to the east; East County Road 700 North to the south; and State Route 135 to the west. The city limits do extend slightly beyond Interstate 65 to the east and East County Road 700 North to the south. The City of Greenwood consists of a mix of residential, commercial, industrial, and agricultural properties.

The City staff has identified several areas based upon customer complaint data and staff's knowledge of drainage problems throughout the City. Many of the drainage complaints consist of minor standing water issues, and some issues that could be alleviated with routine maintenance. These complaints were evaluated and used as part of the master planning process to determine capital and maintenance needs. One of the main goals of the master plan was to identify projects that are potential capital projects and identify smaller problematic areas that can be completed through yearly operation and maintenance (O&M) practices.

In order to assist with a determination of prioritizing the capital projects that were identified as part of the master plan an initial priority rating (IPR) was developed to assist the City in ranking the capital and maintenance projects. Priorities were based upon factors including, but not limited to, severity of issues, type of structures affected, and solution to the drainage problems. These IPRs were developed through a standard form, which can be seen in **Figure 5-** and in **Appendix C**.

It is important to note that the IPR is not the overall deciding factor; it is only one element that will allow the City to quickly identify an individual project's rank within the Stormwater Capital Improvement Program.

IPR's were determined for fifteen (15) areas within the city limits. These areas are shown below in **Table 5-1**, in order of priority ranking. It should be noted that some of the projects have a higher priority ranking than other projects with a higher IPR score. This is due to the fact that some of the projects will offer a greater cost benefit ratio, while other projects had a more significant economic impact. The IPR scores also tend to rank road issues, or those issues affecting multiple residential properties higher, than those affecting a large, single, off-street property. Opinions of probable costs for each project are listed in 2012 dollars. Further details of these areas can be viewed within the master plan document.

City of Greenwood, Indiana Stormwater Summary Report

City of Greenwood				Stormwater Capital Program			
Stormwater Problem Area				Initial Priority Rating Evaluation Sheet			
Street Address: Bomar Lane				DRAFT			
Nearest address or intersection of problem: Bomar Lane and County Line Road							
Rating By: EJR		Date:		Worksheet Date: 08-13-2017			
INSTRUCTIONS: Fill in only "X" and Green Rating as appropriate							
STREET FLOODING	STREET CLASSIFICATION			STREET FLOODING OCCURRENCES			Rating
				Severe Flooding	Minor Flooding	Street Closes 24 Hrs	
	Primary Arterial			4	2	1	
	Secondary Arterial			3			
	Collector			2			
Local Street or Place			1				
VEHICLE DAMAGE - IMPROVEMENTS	MAJOR FAILURE POSSIBLE: WITHIN						Rating
	PUBLIC INFRASTRUCTURE TYPE			Immediate	1-2 Years	3-10 Years	
	As applicable			4	3	2	
	Arterial/Secondary Arterial/Collector/Local			3			
	Local/Minor/Collector/Local/Collector/Local			2	X		
FLOODING	PROPERTY OR FACILITY CLASSIFICATION			FLOODING FREQUENCY			Rating
				Severe Flooding	Minor Flooding	Street Closes 24 Hrs	
	House			4	3	X	
	Business/Industry			3			
	Public/Other			2			
PROPERTY DAMAGE - IMPROVEMENTS	PROPERTY CLASSIFICATION			NUMBER OF STRUCTURES AFFECTED			Rating
				1-10	11-25	26-100	
	House			4	3	2	
	Business/Industry			3			
	Public/Other			2			
FLOODING	FLOODING CONCERN			LOCAL FLOOD CONCERN			Rating
				Within 1/2 Mile	Between 1/2 and 1 Mile	More Than 1 Mile	
	Within 1/2 Mile			4	3	2	
	Between 1/2 and 1 Mile			3			
	More Than 1 Mile			2			
FLOODING	FLOODING CONCERN			LOCAL FLOOD CONCERN			Rating
				Within 1/2 Mile	Between 1/2 and 1 Mile	More Than 1 Mile	
	Within 1/2 Mile			4	3	2	
	Between 1/2 and 1 Mile			3			
	More Than 1 Mile			2			
FLOODING	FLOODING CONCERN			LOCAL FLOOD CONCERN			Rating
				Within 1/2 Mile	Between 1/2 and 1 Mile	More Than 1 Mile	
	Within 1/2 Mile			4	3	2	
	Between 1/2 and 1 Mile			3			
	More Than 1 Mile			2			
FLOODING	FLOODING CONCERN			LOCAL FLOOD CONCERN			Rating
				Within 1/2 Mile	Between 1/2 and 1 Mile	More Than 1 Mile	
	Within 1/2 Mile			4	3	2	
	Between 1/2 and 1 Mile			3			
	More Than 1 Mile			2			
FLOODING	FLOODING CONCERN			LOCAL FLOOD CONCERN			Rating
				Within 1/2 Mile	Between 1/2 and 1 Mile	More Than 1 Mile	
	Within 1/2 Mile			4	3	2	
	Between 1/2 and 1 Mile			3			
	More Than 1 Mile			2			
FLOODING	FLOODING CONCERN			LOCAL FLOOD CONCERN			Rating
				Within 1/2 Mile	Between 1/2 and 1 Mile	More Than 1 Mile	
	Within 1/2 Mile			4	3	2	
	Between 1/2 and 1 Mile			3			
	More Than 1 Mile			2			
FLOODING	FLOODING CONCERN			LOCAL FLOOD CONCERN			Rating
				Within 1/2 Mile	Between 1/2 and 1 Mile	More Than 1 Mile	
	Within 1/2 Mile			4	3	2	
	Between 1/2 and 1 Mile			3			
	More Than 1 Mile			2			
FLOODING	FLOODING CONCERN			LOCAL FLOOD CONCERN			Rating
				Within 1/2 Mile	Between 1/2 and 1 Mile	More Than 1 Mile	
	Within 1/2 Mile			4	3	2	
	Between 1/2 and 1 Mile			3			
	More Than 1 Mile			2			
FLOODING	FLOODING CONCERN			LOCAL FLOOD CONCERN			Rating
				Within 1/2 Mile	Between 1/2 and 1 Mile	More Than 1 Mile	
	Within 1/2 Mile			4	3	2	
	Between 1/2 and 1 Mile			3			
	More Than 1 Mile			2			
FLOODING	FLOODING CONCERN			LOCAL FLOOD CONCERN			Rating
				Within 1/2 Mile	Between 1/2 and 1 Mile	More Than 1 Mile	
	Within 1/2 Mile			4	3	2	
	Between 1/2 and 1 Mile			3			
	More Than 1 Mile			2			
FLOODING	FLOODING CONCERN			LOCAL FLOOD CONCERN			Rating
				Within 1/2 Mile	Between 1/2 and 1 Mile	More Than 1 Mile	
	Within 1/2 Mile			4	3	2	
	Between 1/2 and 1 Mile			3			
	More Than 1 Mile			2			
FLOODING	FLOODING CONCERN			LOCAL FLOOD CONCERN			Rating
				Within 1/2 Mile	Between 1/2 and 1 Mile	More Than 1 Mile	
	Within 1/2 Mile			4	3	2	
	Between 1/2 and 1 Mile			3			
	More Than 1 Mile			2			
FLOODING	FLOODING CONCERN			LOCAL FLOOD CONCERN			Rating
				Within 1/2 Mile	Between 1/2 and 1 Mile	More Than 1 Mile	
	Within 1/2 Mile			4</			

Table 5-1 - Summary of Stormwater Master Plan Projects

Priority	IPR	Drainage Area Description	Opinion of Probable Total Project Costs (2012 Dollars)
1	93	Pleasant Creek (ACOE Project)	\$7,750,000
2	79	John Bonner (Fry Road and Loews Boulevard)	\$890,000
3	28	Southern Bowl	\$360,000
4	73	Green Valley Neighborhood	\$1,570,000
5	62	Cottonwood (Tracy Ditch)	\$1,100,000
6	62	Old City Park	\$875,000
7	60	Valle Vista*	\$50,000
8	51	Endress Place Development	\$140,000
9	59	Northern Park*	\$30,000
10	55	Lakeview Additions*	\$18,000
11	49	Pleasant Run (Greenwood Mall)	\$1,000,000
12	47	Bomar Lane**	\$-
13	46	Southern Green	\$300,000
14	35	Eden Estates	\$190,000
15	26	Country Aire Subdivision*	\$300,000
Total			

Priority	IPR	Drainage Area Description	Opinion of Probable Total Project Costs (2012 Dollars)
		Misc. City Wide Projects***	\$2,500,000
		Parks Educational Project Number 1	\$225,000
		Parks Educational Project Number 2	\$225,000
Total			\$17,523,000
*Denotes potential Maintenance Projects			
**Project costs will be determined by impact of the selected alternative from the ACOE Project.			
***Project costs will be evenly distributed over the entire 10-year period.			
Note: Refer to the Stormwater Master Plan for detailed project costs.			

5.1 Project Summaries

Pleasant Creek (ACOE Project)

This project was part of an Army Corps of Engineers study of the Pleasant Creek basin authorized under Section 205 of the 1948 Flood Control Act. The study, which was started in the late 90's, was eventually completed in 2006. The study looked at possible flood damage to 159 structures within the flood zone along Pleasant Creek, of which 133 structures were residential, 23 were commercial, and the remaining 3 structures were public facilities. A 1% chance flood event, which is a 100-year flood, is estimated to affect 129 structures and cause over \$5.5 million in total damages; approximately 40% of this cost coming from damage to commercial facilities, and the remaining 60% to residential. The 0.2% chance flood event, which is a 500-year flood, is estimated to affect 144 structures and cause over \$5.9 million in total damages.

Numerous options were studied at a feasibility level, but many of them became impractical when looking at the cost to benefit ratios. Ultimately the study settled on an in-line detention basin along Pleasant Creek. The detention basin will be a dry bottom reservoir that would detain excessive runoff during periods of high rain fall, and would then drain back into Pleasant Creek. This basin would reduce the chance of flooding by as much to 70% within the Pleasant Creek Flood Area, and could possibly have an effect on flooding along Pleasant Run. The basin will also have a positive effect on the water quality, as some of the floodwater will naturally infiltrates out the bottom of the basin prior to the remainder draining back into Pleasant Creek.

John Bonner (Fry Road and Loews Boulevard)

The John Bonner project is located on the north side of Greenwood, southwest of the Greenwood Mall. The existing storm sewers consist mainly of two small diameter corrugated metal pipes, and a large roadside ditch on the north side of Fry Road. The two pipes along with the structure within the roadside ditch are of particular concern. The bottom of the north pipe has completely eroded away, and is at risk of failure.

At one point the pipe joints were grouted and sealed, in hope that the pipe wouldn't collapse and cause the road to fail. The headwall/inlet structure is also a concern, because of erosion around the inlets. This project is designed to remediate the erosion within the roadside ditch along Fry Road. This alternative will completely enclose the roadside ditch, and replace the two existing 24-inch pipes will be replaced with a single 36-inch pipe. This project could the Stormwater Department to Partner with the Parks Department.

Southern Bowl

The Southern Bowl project deals with a large drainage pipe, which runs across the middle of the Southern Bowl parking lot. This pipe is approximately 5-feet or more in diameter, which drains a portion of the US 31 corridor, the frontage road leading up to the Southern Bowl, and much of the parking lot. During heavy rain events the pipe is likely to backup and cause flooding within the Southern Bowl parking lot, which, at one point, was severe enough to cause vehicles within the parking lot to become buoyant. The pipe was replaced from US 31 to just east of the Southern Bowl parking lot.

The proposed project will add several structures; which will ensure that the inlets no longer directly connect into the main storm trunk line. This will allow the City staff to more easily perform routine maintenance and replace smaller sections of pipe should a failure occur.

Green Valley

The Green Valley project is served by roadside ditches and a limited storm sewer system. This storm sewer system appeared to be original with the subdivision, and is reaching its effective service life. Off-site flows from the adjacent areas cause additional surface runoff to fill and back up the storm sewer system, which causes flooding throughout the subdivision.

This proposed project is designed to upgrade the existing storm sewer system by adding hybrid ditches and conventional storm sewer throughout the Green Valley subdivision. This upgraded system will be designed to handle the additional runoff from the adjacent areas, which currently inundates the existing system. The Green Valley subdivision appears to have sufficient room between the edge of pavement and the property line to install a large hybrid ditch, which uses natural swales and perforated pipe to drain water away from yards and infiltrate into the ground. During heavy rains, excess water that is unable to soak into saturated ground will flow into a traditional storm drain system via a raised inlet. The system helps reduce flooding and promotes infiltration into the ground, naturally cleaning the water. This infiltration system slows down runoff into streams and drainage channels which helps limit erosion.

Cottonwood (Tracy Ditch)

The Cottonwood project will deal with flooding upstream from the Tracy Ditch and the detention basins inability to discharge into the Tracy Ditch. This causes the storm sewers to backup and also cause severe street flooding. There have been several instances where sections of Stop 18

were closed, or travel was restricted due to the flooding. One of the reasons for the backup of Tracy Ditch is the buildup of sediment and debris at culverts and within the channel itself. This buildup inhibits the ability for the water to flow properly, and does not allow pipes that outlet into Tracy Ditch to drain properly.

This proposed project is designed to provide a multi-year maintenance plan for the Tracy Ditch. This maintenance plan will allow the ditch to flow more efficiently, and will also help to relieve the street flooding caused by the detention pond outlet pipes backing up. Additionally, this plan will include the inspection and cleaning of the outlet pipes from the detention ponds that connect into the Tracy Ditch.

Old City Park

The Old City Park project will deal with two separate issues, both of which affect Pleasant Creek. The first problem that affects the Old City Park area is the amount of erosion caused by Pleasant Creek. As the creek winds its way through Old City Park, the banks become eroded and fail. There is some significant bank failure along Pleasant Creek, and City staff has attempted to reinforce the bank with waste concrete material from road projects. The second issue with this project is a retaining wall supporting a parking lot just west of Old City Park. Should this retaining wall fail, it could potentially backup Pleasant Creek and lead to flooding.

The proposed project will be designed to re-establish a good hydraulic profile for the creek, and will also employ the use of natural vegetation, or armoring. This natural armoring will be more visually appealing to residents as they visit the Old City Park area, but will also keep the ditch bank established. The other portion of the project will involve the replacement of the failing retaining wall, and a portion of the parking lot. The project will also help to re-establish the ditch profile through this section of the creek, and potentially provide a more hydraulically efficient section.

Valle Vista

Valle Vista neighborhood has a variety of storm water issues, mainly a result from infrastructure failure. The first issue is due to a section of pipe that has been crushed and has become clogged with debris, and causes the stormsewer to backup. This section of pipe serves as the ultimate outfall for a significant amount of surface runoff, and has required routine maintenance to insure that the pipe is not clogged.

The second problem area is due to a ditch that has become overgrown and is experiencing erosion and sediment build up. This causes the storm sewer system to backup, and force surface runoff to find an alternative route to Grassy Creek or the detention basin. This ditch also holds water after rain events, and creates breeding conditions for mosquitoes. This is of particular concern with the recent rise in West Nile virus, and the proximity to a number of homes.

The proposed projects will replace the existing pipe with a new, more hydraulically efficient pipe. This pipe will also be more resistant to crushing than the previous metal pipe, which should prevent other issues from arising. The project will also regrade the existing ditch, and re-establish the banks with natural seeding. This project will also partially clear out the ditch of nuisance vegetation.

Endress Place Development

The Endress Place Development project will deal with the flooding of a large industrial park on the south side of Greenwood. The east side of the project is drained by a sufficiently sized ditch, which then crosses Endress Place by way of 3 corrugated metal pipes to another section of ditch. These pipes and ditch are the main concern for the project area, which cause a significant loss in hydraulic capacity.

The proposed project will be done in multiple phases, and will consist of immediately upgrading the existing facilities. The ditch on the west side of Endress Place will be re-established to have more capacity, and the three broken pipes will be replaced with single box culvert. As this portion of the project is being designed a hydraulic study will look at the flow patterns through the industrial park and determine if any additional tasks are required. This study will look at affects of wetlands and other runoff control measures to reduce the likelihood of flooding.

Northern Park

The Northern Park project will deal with the Jolly Brook, which has caused some severe erosion at the intersection of Meridian Street and Park Lane. The stream has completely eroded the vegetation that was used for stabilization, and has also caused the storm sewer to back up and flood out this intersection.

The proposed project will help to eliminate erosion and backup issues by utilizing hearty natural plantings along the ditch as much as possible, and use riprap at the pipe discharge location. The ditch will also be regraded to eliminate low points along the ditch, which should help increase the hydraulic efficiency of Jolly Brook.

Lakeview Additions

The Lakeview Additions project will deal with a rear yard ditch that has become silted in. This ditch serves as a main form of conveyance for some street inlets to a large storm sewer system, and also collects the local residential yards. Due to the lack of hydraulic capacity within the ditch, the street inlets cannot properly drain, and have caused some localized street flooding. The proposed project will re-establish the ditch by regrading to form a better hydraulic profile, and to encourage positive flow. The ditch will then be reseeded with natural plantings, which will help reduce erosion. This project will also allow the street inlets to properly drain, and lessen the risk of street flooding.

Pleasant Run (Greenwood Mall)

The Pleasant Run project will deal with flood mitigation near the intersection of Madison Avenue and Greenwood Park Drive East. This intersection, and much of the surrounding area, is within the 100-year flood zone. During the 2008 flood several of the businesses on the east side of Madison Avenue were damaged due to flooding, and many have subsequently shut down. The proposed project will deal with flood mitigation within the Greenwood Park Mall parking lot, or creating a basin to deal with some of the extra surface runoff generated by the mall.

Bomar Lane

The Bomar Lane project will deal with flood mitigation affecting numerous homes within northwest Greenwood. Many of these homes are located within a flood zone, and during the 2008 flood event became inundated. This inundation caused damage to primary and secondary residential structures, and also required the extraction of several residents at the southern end of Bomar Lane. The proposed project will be determined on the extent of flooding mitigation achieved from the Pleasant Creek (ACOE) project. Without this project completed and in-service, it is nearly impossible to determine the extents of flooding mitigation required to remove the homes from the flood zone.

Southern Green

The Southern Green project will deal with flood mitigation of several homes located west of the intersection between East Stop 18 Road and South Emerson Avenue. These homes are drained via the large roadside ditch along Stop 18, and a storm sewer within the right-of-way. Though there appears to be adequate capacity within the storm sewer to handle the road right-of-way, it appears as though additional offsite drainage could be contributing to inundation of the storm sewer and road side ditch. It also appears as though the homes have a lower finished floor elevation than indented. During moderate to heavy rain events, the surface runoff often comes very close to entering the homes.

The proposed project will construct a large detention basin at the southeast corner of the intersection, which should be sized to collect runoff from a portion of the surrounding developments, and the majority of the farm field. This basin will either be a dry bottom detention basin, or a vegetated basin. With the vegetated basin, it may be possible to partner with the City of Greenwood Park's department and create a small trail head or park area.

Eden Estates

The Eden Estates project will deal with a failing pipe, which is located just east of the intersection between Grassy Creek Lane and Smith Valley Road. The pipe running along the property line between the apartment complex and a residential subdivision has failed. Trees roots have penetrated several sections of pipe, causing the upstream system to backup and streets to flood.

The roadside ditch is also subject to erosion and potential slope failure. There is also another issue with this project, which is the ditch has some erosion problems and bank failure.

The proposed project will involve the lining of the pipe with the process commonly referred to as Cast In Place Pipe (CIPP). This type of liner system will insert a resin impregnated felt liner through the damaged pipe, and will cure within the existing pipe. This will slightly reduce the diameter of the pipe; however, it will increase the efficiency of the pipe. This is accomplished by smoothing out the flow channel, and removing the flow restrictions (i.e. roots). The ditch will be fixed through minor regrading and re-establishing the banks with native vegetation where applicable.

Country Aire Subdivision

The Country Aire project will deal with the investigation of piping within the Country Aire Subdivision, and the possibility of replacement or rehabilitation of a portion of those pipes. This project initially looked at a singular pipe; however, after further investigation it was determined to increase the scope of the project to investigate all the piping within the project area. Several of the pipes have failed, and have formed sinkholes within residential properties. This indicates that the pipe has suffered structural failure, and soil has intruded the pipe.

The proposed project will perform an initial investigation of nearly 4,000 linear feet of pipe, and a determination will be made if any of the pipes will need to be replaced or rehabilitated. Pipe replacement will be much more expensive than the lining of pipes; however, lining pipes causes the inside diameter of the pipes to be decreased by one size (i.e. A pipe with a 24-inch inside diameter will now have an inside diameter of 21-inches). Lining also can only overcome certain pipe failures, and often times cannot fix pipes with a severe joint offset. The amount of rehabilitation will completely depend on the findings of the video inspection.

6 Stormwater Program Organization

The City of Greenwood adopted the provisions IC 8-1.5-5 establishing a Stormwater Management District in April 2012. The code further establishes a Stormwater Management Department and a Board of Stormwater Management.

The Stormwater District extends to the corporate boundaries of the City of Greenwood and is established to protect the public health and welfare, and for the purpose of assessing fees to pay for the cost of stormwater facilities and services.

The Stormwater Management Department operates as a separate department under the direction of the Mayor and approval of the Board of Stormwater Management. The Department carries out critical program functions including program administration, planning and implementation.

The Board of Stormwater Management, which consists of three directors appointed by the Mayor, operates as the governing body over the Stormwater Management Department. The Board makes final approval of policy changes within the Stormwater District, and provides final decisions on recommendations made by the Stormwater Management Department.

7 Rate Study Findings

When establishing a stormwater service charge it is necessary to consider the different costs which establish program needs. These costs include administrative, operations and maintenance, and project development and implementation. The costs determine program revenue needs and with additional analysis can determine how costs are distributed to program beneficiaries. In the following sections a detailed summary of the steps taken to arrive at the recommended stormwater service charge are discussed.

7.1 Operation and Maintenance Costs

Operation and maintenance (O&M) costs were determined for the newly created Greenwood Stormwater District, which looked at the employee costs, supplies and contract services costs, and O&M capital costs. The costs were escalated by an estimated cost of living of 3% per year; however, the O&M capital costs were not escalated per year. Instead a budget of approximately \$50,000 per year was established, except in the years where large equipment purchases are required. It was determined that over the 10-year period that the average yearly costs for O&M are approximately \$1.2 million per year. These costs also included contingency for regulatory elements that are required for the district to comply with current state and federal laws.

7.2 Capital

As discussed in the **Section 5** it was determined that the master plan contains approximately \$17.5 million in capital projects. Two methods were considered to complete this capital plan, and assist the City to cover their costs. Option one included a “pay as you go” program, while the second option considered debt financing. It was determined that to keep the costs to the rate payers to a minimum, a combined program would offer the greatest benefit. This combined program proposes to pay 55% of the capital program through cash, and the remaining 45% to be covered by debt. By spreading the costs out in this fashion it can minimize the impact to the users, and allow the City to propose a 10-year capital program.

7.3 Equivalent Residential Unit (ERU)

The interim stormwater service charge is based on total area of a property/parcel. The proposed final rate is based on a property’s impervious area. To properly determine the final stormwater service charge, it was necessary to calculate an Equivalent Residential Unit (ERU). The City’s proposed stormwater service charge will be billed to property/parcels within the municipal boundaries of the City of Greenwood that contribute to stormwater runoff or discharge. Impervious surface area such as rooftops, parking lots, and other hard surfaces cause stormwater to runoff and become concentrated flow from the property. The ERU is defined as an average of impervious surface area on an average residential property or parcel.

The ERU was determined by selecting a random sample of residential properties/parcels and measuring the amount of impervious surface area on each (Refer to **Figure 7-1**). From the measured impervious area data the City established the average (mean) and median values of impervious area, which established a representative ERU throughout the District. Approximately 10% of the total residential parcels were selected at random to perform the ERU determination. Based on the findings of the analysis it was recommended that the City of Greenwood adopt an ERU of not less than 2,800 square feet of impervious area for the stormwater service charge base billing unit. The City then completed impervious area measurement of all non-residential properties in the District. Using an ERU of 2,800 square feet it was determined that City contained approximately 42,300 billable ERUs.

7.4 Stormwater Service Charge Rate

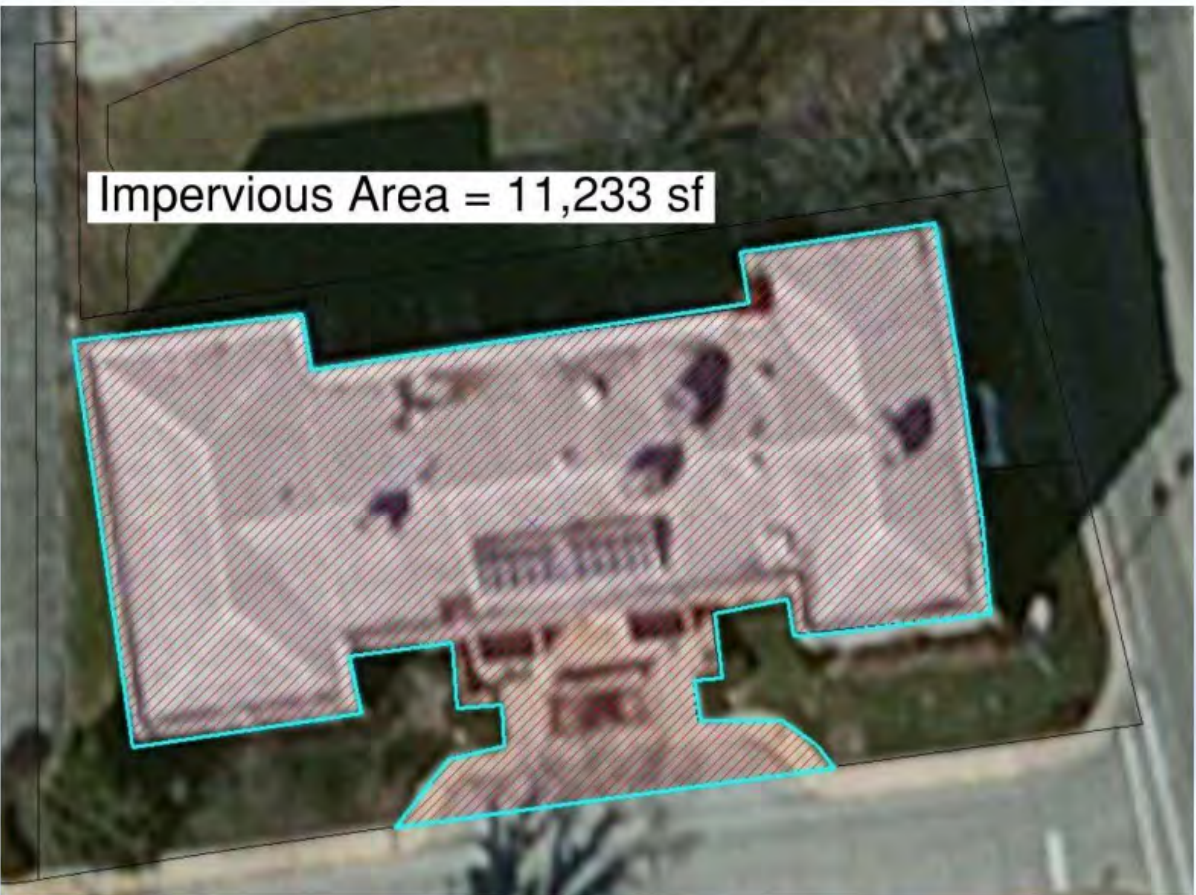
Utilizing the total number of ERUs from **Section 7.3**, a stormwater service charge rate was developed. This rate is based upon the needs of the proposed Capital Program (i.e. project funding, staffing, regulator costs, etc.), which are weighed against the burden upon the rate payers. The rate payers include both residential and non-residential property owners. Several rate scenarios were analyzed. The proposed scenario assesses all property owners, residential and non-residential, a flat, monthly service charge of \$5.00 per ERU.

Impervious Area and Proposed Stormwater Billing



Residential Property Impervious Surface Area

1 ERU = \$5.00/Month



Non-Residential Property Impervious Surface Area

$11,233 / 2,800 = 4$
 $4 \text{ ERUs} \times \$5.00 = \$20/\text{Month}$



Figure 7-1 - ERU Determination

8 Conclusions

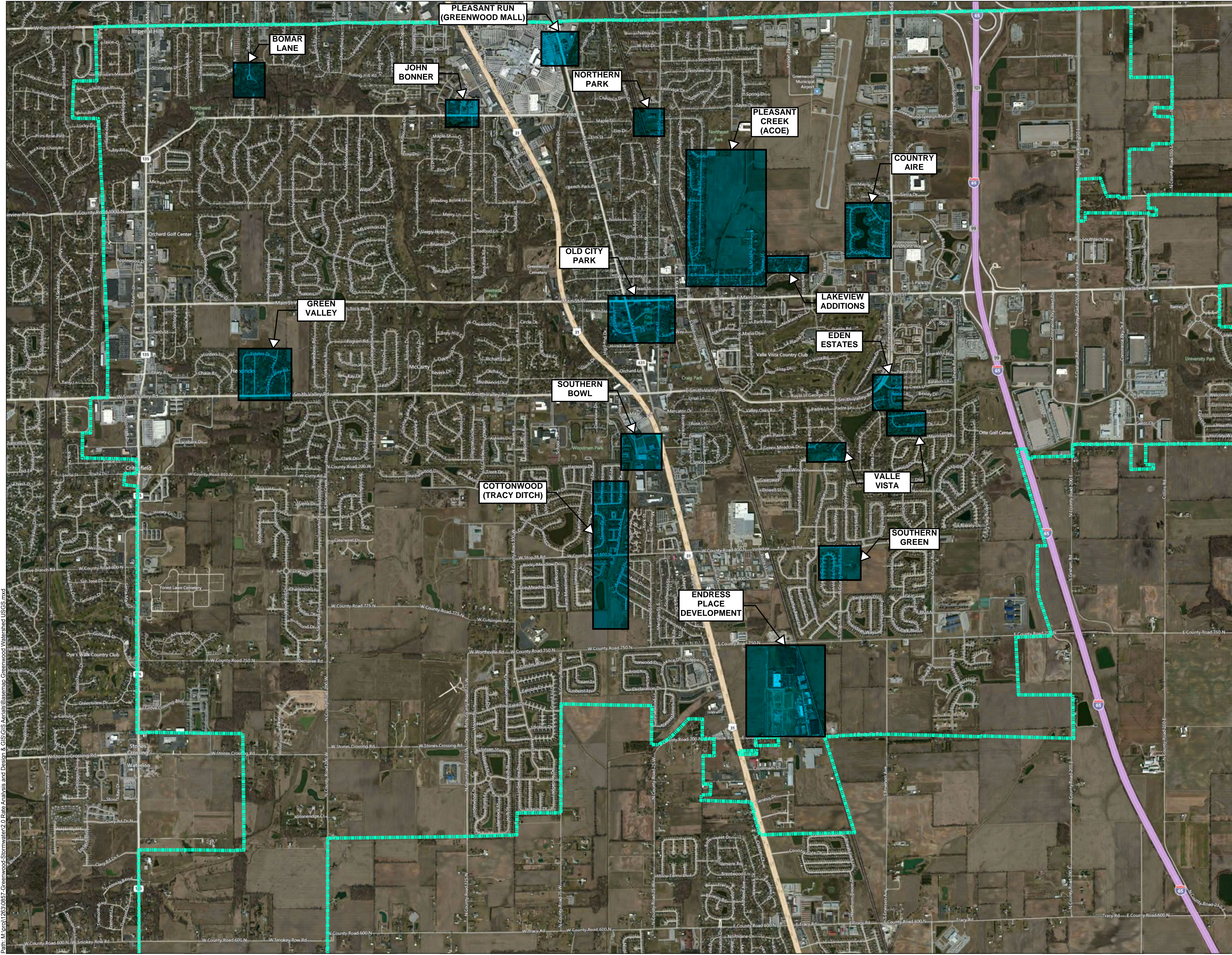
The City of Greenwood is a federal and state regulated stormwater community and MS4, and carries out the required annual stormwater program activities per its approved National Pollution Discharge Elimination System (NPDES) permit (INR040032). The City also carries out annual operation and maintenance (O&M) activities on their storm sewer infrastructure system and associated assets. Sources of funding for stormwater activities have become limited due to the requirements of other needs within the City, and cannot adequately provide the required funds necessary to operate the stormwater system. The City performs required annual regulatory tasks, and it is anticipated that these future costs will only grow. The City has also identified several capital projects that will address current drainage needs; however, current and projected funding restricts the amount of projects that could be completed.

In order to meet the funding needs of the City's Stormwater Department, the City has proposed to establish a final stormwater service charge, which will provide a dedicated funding source for annual regulatory, O&M costs, and provide revenue for proposed stormwater capital projects. The City's proposed stormwater capital program, which is proposed to be completed over a 10-year period, is estimated to cost approximately \$19.0 million.


A proposed stormwater service charge will be assessed to all property owners within the District and is based upon the amount of impervious surface area, which generates stormwater runoff from the property. To ensure that residential and non-residential properties are charged a fair and impartial monthly fee, the City determined an Equivalent Residential Unit (ERU), which defines the average amount of impervious surface on an average residential parcel as 2,800 square feet (sq. ft.). The City utilized ArcGIS, the City's existing parcel data, and aerial photography to identify the approximate 42,300 ERUs within the District.


To meet identified funding needs the City proposes a stormwater service charge of \$5.00 per ERU per month to all properties/parcels within the District. Residential properties will be billed one (1) ERU per month while non-residential properties will be billed \$5.00 per ERU per month for the total impervious surface area contained on the property.

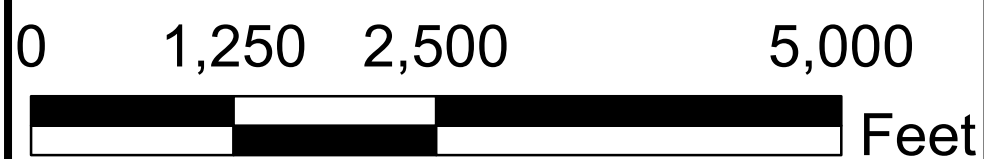
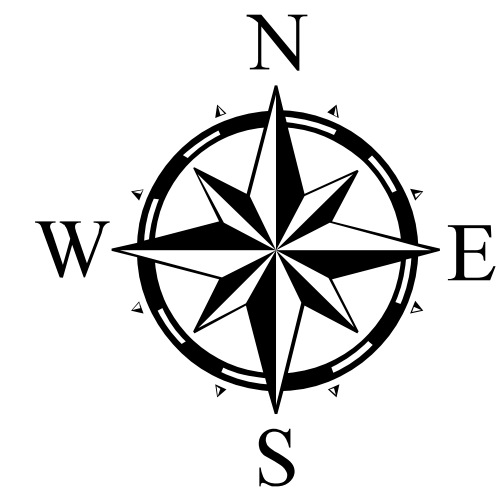
Appendix A
Proposed Capital Project Location Map



Legend

 Greenwood City Limits

 Project Location



**PROJECT LOCATIONS
GREENWOOD CITY LIMITS**

**CITY OF GREENWOOD
STORMWATER PROGRAM**

Date: August 2012
Produced by: DLZ
Data Source: IMAGIS
This map does not represent a legal document. It is intended to serve as a graphical aid only. Information shown on this map is not warranted for accuracy or merchantability.

